Electronic Version
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Claims

[c1] What is claimed is:

1.An RF transceiver module for wireless communication devices comprising:

a multi-layered substrate;

an RF transceiver IC mounted on the multi-layered substrate for receiving and transmitting voice or data signals;

at least one band selection filter mounted on the multi-layered substrate for filtering received RF signals;

an antenna switch integrated in the multi-layered substrate which is capable of being switched to transmit RF signals generated by the power amplifiers to the external antenna or to receive RF signals from an external antenna to the RF transceiver IC through the band selection filter;

a plurality of passive devices embedded in the multi-layered substrate;

wiring embedded in the multi-layered substrate for electrically connecting the passive devices, the RF transceiver, and the band selection filter;

a shielding via fence formed under the band selection filter for isolating high power RF signals produced by a

power amplifier from the RF transceiver IC;
a shielding ground plane formed one or two substrate layers beneath the transceiver IC for providing isolation between the embedded passive devices and the RF transceiver IC; and
a plurality of input, output, and grounding pads formed on the bottom of multi-layered substrate.

[c2] 2.The RF transceiver module of claim 1 that is mounted on a printed circuit board (PCB) and the RF transceiver module is electrically connected to the PCB through the input and output pads.

[c3] 3.The RF transceiver module of claim 2 being electrically connected to a digital signal processor which is mounted on the PCB for converting received analog signals into digital signals, and converting digital signals into analog signals.

[c4] 4.The RF transceiver module of claim 1 wherein the antenna switch is electrically connected to at least one power amplifier which amplifies RF signals transmitted by the RF transceiver IC.

[c5] 5.The RF transceiver module of claim 4 wherein the antenna switch is electrically connected to a plurality of power amplifiers, and the antenna switch is capable of

being switched to select a power amplifier to transmit RF signals from.

[c6] 6.The RF transceiver module of claim 1 wherein the band selection filter is a surface acoustic wave (SAW) filter.

[c7] 7.The RF transceiver module of claim 6 wherein the SAW filter is in bare die form.

[c8] 8.The RF transceiver module of claim 6 wherein the SAW filter is in packaged form.

[c9] 9.The RF transceiver module of claim 1 wherein the RF transceiver IC is in bare die form.

[c10] 10.The RF transceiver module of claim 1 wherein the RF transceiver IC is in packaged form.

[c11] 11.The RF transceiver module of claim 1 wherein the multi-layered substrate is a low temperature co-fired ceramic (LTCC) substrate.

[c12] 12.The RF transceiver module of claim 1 having a plurality of band selection filters mounted on the multi-layered substrate for filtering received RF signals of corresponding frequency bands wherein the antenna switch is capable of being switched to direct received RF signals to a selected band selection filter.

[c13] 13.The RF transceiver module of claim 12 being compliant with a GPRS mobile phone standard.

[c14] 14.The RF transceiver module of claim 12 being compliant with a GSM mobile phone standard.